Remarks/Arguments

Claims 1-10 and 17-22 were pending in this application. Claims 16-21 were previously withdrawn. Within the final Office Action, claims 1-10 and 17-21 are rejected under 35 U.S.C. § 112, first paragraph; claims 1-3, 5-10, and 17-22 are rejected under 35 U.S.C. § 102(e); claims 1-3, 5, 6, 8, and 10 are rejected under 35 U.S.C. § 102(b); and claims 1-10 and 17-22 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting.

In the amendments made above, claims 1, 10, and 22 have been amended, claim 3 has been canceled, and claims 23 and 24 have been added. Accordingly, claims 1, 2, 4-10 and 17-24 are pending. In light of the amendments made above and the remarks made below, the Applicant respectfully requests reconsideration.

Rejections under 35 U.S.C. § 112, first paragraph

Within the final Office Action, it is stated that the claims contain subject matter that was not described in a way to show that the inventor had possession of the claimed invention. Specifically, it is stated:

> The new limitation "maintaining within a selected range a difference between a sealing force and a force generated within the processing volume" added to claims 1 and 10 is not supported in the text in such a manner to enable one of ordinary skill in the art to determine what the "selected range" is from the specification.

Thus, it is stated within the final Office Action that after reading the Specification, one skilled in the art of semiconductor processing tools would be unable to determine (1) a lower value for a difference between a sealing force and a force generated within the processing volume (ΔF), that is, a minimum value for ΔF that ensures a processing volume is maintained even when pressures generated during device processing swing and (2) unable to choose a maximum value for ΔF so that seals are not exposed to unnecessarily high forces that can cause seals to fail or that produce particulates. (*See, e.g.,* Specification at page 2, lines 11-15 and 21-23) Because this range of values is clear from the goal of the invention, the teachings in the Specification, and allowable experimentation, the Applicant respectfully disagrees with this conclusion.

The present invention is directed to "optimally sealing" processing volumes. In the Specification, at page 26, lines 10-12, it is explained: "By limiting [the] sealing force to [a] minimum, a processing volume can be maintained by advantageously using the minimum energy

required." Minimizing the sealing force also minimizes the difference (ΔF) between the sealing force and a processing force generated within a processing volume. (*See, e.g., id.* at 26, lines 10-12). If the sealing force is not kept below a value and is allowed to grow to any value, the invention is not met. The Specification also makes clear that in one embodiment, a sealing force should be kept above a threshold, so that the processing volume is maintained even during small pressure swings. (*See, e.g., id.* at page 30, line 27, to page 31, line 3) The Specification, as filed, thus makes clear that the Applicant had possession of maintaining a force differential within a range.

The Specification also gives guidance on why and how to determine this range, providing an equation (*e.g., id.*, at page 26, line 20) and values of force differentials computed using the equation (*e.g., id.*, Table 1 at page 30). As to the lower end of the range, it is stated in the Specification, at page 31, lines 14-16, in a discussion about a method in accordance with the present invention, "In the step 1405, ΔF_{thresh} is set to 0 lb-f. It will be appreciated that ΔF_{thresh} can be set to another value appropriate to the circumstances." The appropriate circumstances would consider pressure swings that had to be accounted for (thus determining a lower bound for the range of ΔF) and would also consider maximum forces that would, for example, minimize pressure on the seals and other components of an apparatus in accordance with the present invention (an upper bound for the range). These values are determined from equation (1) on page 26 of the Specification, the accompanying text, and Table 1.

Moreover, experimentation is allowed to determine this range, as long as it is not undue. *See, e.g., In re Wands*, 858 F.2d 731, 736-737 (Fed. Cir. 1988). This is especially true where, as here, experimenting is routine in the art. *Id.* at 737 (experimentation is permissible if it is routine and specification provides guidance for conducting it). Such calculations–though not used for the identical purposes as in the present invention–are routinely calculated in the art: to measure pressures on seals, to ensure that processing volumes are maintained, and to ensure that substrates undergoing processing are not subjected to excessive pressures, to name a few uses. In other words, one skilled in the art would recognize how to choose a range of force differentials from among a plurality of ranges, to suit the application at hand.

Because one skilled in the art would recognize how to select a range of force differentials for practicing the claimed invention, the rejections of the independent claims 1 and 10, and hence their dependent claims 2, 4-9, and 17-21, under 35 U.S.C. § 112, first paragraph, should be withdrawn.

Rejections under 35 U.S.C. § 102(e)

Within the final Office Action, claims 1-3, 5-10, and 17-22 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,921,456 to Biberger et al. The Applicant respectfully traverses these rejections.

Biberger is directed to a high pressure chamber that uses a single mechanical drive mechanism to form and maintain a wafer cavity. Referring to Figure 3 of Biberger, the wafer cavity 44 is formed by venting a pneumatic cavity 60 and pressurizing a hydraulic cavity 58 to drive a wafer platen 34 into a spacer/injection ring 42. (Biberger, col. 4, lines 16-20) In Figure 6, Biberger discloses an alternative embodiment that also includes a pneumatic cylinder 86 contained within a hollow portion of a piston neck 56A. Biberger recognizes that, for the processing cavity to be maintained during processing, the fluid within the hydraulic cavity 58 must be maintained at a pressure greater than that of the pressurized fluid within the wafer cavity 44. (*Id.*, lines 23-28) Biberger does not mention selecting force differentials or non-linearly varying pressures to achieve this end.

Claim 1 is directed to an apparatus for processing a semiconductor wafer. The apparatus comprises, in part, a seal energizer configured to maintain an upper element against a lower element to maintain a processing volume by maintaining a difference between a sealing force and a force generated within the processing volume within a range selected from a plurality of ranges. The force generated within the processing volume is produced by a processing pressure that varies between a vacuum and a supercritical pressure. Claim 1 now more clearly recites that the force differential is selected, from among a plurality of ranges. One such result is to minimize a force on seals or limit it to a selected value. The selected difference in forces is thus not a single, maximum, differential that necessarily occurs during processing, such as stated within the final Office Action. (Final Office Action ¶¶ 5 and 10). In other words, the selected range is not just "any sealing force that is greater than the force generated by the processing volume." (*Id.* ¶ 5) For at least this reason, claim 1 is allowable over Biberger.

Support for the recitation that a range is selected from a plurality of ranges is discussed above, in the section titled **Rejections under 35 U.S.C., § 112, first paragraph**. Support for the recitation that pressures generated within a processing volume are produced by processing pressures that vary between a vacuum and a supercritical pressure finds support in the Specification at, for example, page 10, lines 9-11, and page 28, lines 17-21. Thus, no new matter has been added.

Claim 3 has been canceled, so its rejection is moot. Claims 2, 5-9, and 17-21 all depend

on claim 1. Because claim 1 is allowable over Biberger, claims 2, 5-9 and 17-21 are all also allowable as depending on an allowable case claim.

Claim 2 is also allowable because it recites an allowable limitation that was **ignored** within the final Office Action. Claim 2 recites "wherein the seal energizer is configured to *minimize* a non-negative net force against one of the upper element and the lower element above a threshold value" (italics added). Nowhere within the final Office Action is it stated that Biberger teaches this limitation. For this additional reason, claim 2 is allowable over Biberger.

Claim 10 is directed to a an apparatus for processing a semiconductor wafer. Claim 10 recites, in part, a means for *non-linearly varying* a sealing pressure to maintain *within a selected range* a difference between a sealing force and a force generated within the processing volume, thereby maintaining the processing volume. As explained above, Biberger does not disclose this element. For at least this reason, claim 10 is allowable over Biberger.

The added limitation of "non-linearly vary a sealing pressure" finds support throughout the application as filed, such as in the original claim 1. Accordingly, no new matter has been added.

Within the final Office Action it is stated that Biberger discloses a "controller . . . to control the sealing pressure that varies non-linearly with the processing pressure." (Final Office Action ¶ 5) It is also stated that "The Examiner notes that the non-linear relationship between the sealing pressure and processing pressure is inherent in the structure of the lower element and the seal energizer." This is contradicted by the Examiner's own statement that "The seal energizer . . . maintains the P1-P2 as a constant." The Applicant assumes that the Examiner means that the relationship between a force differential and a pressure is non-linear. This is different from *non-linearly varying a pressure* to take into account a non-linear relationship between pressures and a force differential to thereby efficiently maintain a processing volume in accordance with the present invention. Any rejection based on a mischaracterization of Biberger is improper and should be withdrawn.

Claim 22 is directed to an apparatus for processing a semiconductor wafer. Claim 22 recites, in part, means for maintaining the processing volume by determining the variable processing pressure and *generating a sealing pressure that varies non-linearly* with the processing pressure. Biberger does not disclose this element. Accordingly, the rejection of claim 22 in light of Biberger is improper and should be withdrawn.

Rejections under 35 U.S.C. § 102(b)

Within the final Office Action, claims 1-3, 5, 6, 8, and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 2,873,597 to Fahringer. The Applicant respectfully traverses these rejections.

Fahringer is directed to pressure seals for pressure vessels used to process textile materials under high pressures. Referring to Figure 1, Fahringer discloses an apparatus comprising a pressure vessel 10 having a lid 14 and compartments 40. The lid 14 is kept in place by generating a pressure within the compartments 40, thereby generating a downward force on sealing rollers 31.

Fahringer does disclose maintaining a pressure differential between the pressure vessel 10 and the compartments 40 (col. 4, lines 53-56). Fahringer does not, however, disclose maintaining a difference between a sealing force and a force generated within the processing volume within a range selected from a plurality of ranges, as recited in claim 1. Nor does Fahringer disclose "a seal energizer configured to non-linearly vary a sealing pressure to maintain within a selected range a difference between a sealing force and a force generated within the processing volume, thereby maintaining the processing volume," as recited in claim 10. As explained in the Specification, maintaining a force differential is different from maintaining a pressure differential. (*See, e.g.*, Specification at page 27, lines 11-12). Fahringer's discussion of maintaining a pressure differential is thus different from maintaining a force differential. Finally, Fahringer does not disclose varying a processing pressure between a vacuum and a supercritical pressure.

As explained above, claim 1 recites, in part, a seal energizer configured to maintain the upper element against the lower element to maintain the processing volume by maintaining a difference between a sealing force and a force generated within the processing volume within a range selected from a plurality of ranges. The force generated within the processing volume is produced by a processing pressure that varies from a vacuum to a supercritical pressure. Fahringer does not disclose either of these elements. For at least these reasons, the rejection of claim 1 in light of Fahringer should be withdrawn.

Claim 3 has been canceled, so its rejection is moot. Claims 2, 5, 6, and 8, all dependent on claim 1, are all allowable as depending on an allowable base claim.

Claim 10 recites, in part, means for non-linearly varying a sealing pressure to maintain within a selected range a difference between a sealing force and a force generated within the processing volume, thereby maintaining the processing volume. The force generated within the

processing volume is produced by a processing pressure that varies between a vacuum and a supercritical pressure. Fahringer does not disclose either of these elements. For at least these reasons, the rejection of claim 10 in light of Fahringer should be withdrawn.

As in the rejection under § 102(e), it is stated within the final Office Action that "The Examiner notes that the non-linear relationship between the sealing pressure and processing pressure is inherent in the structure of the sealing means of Fahringer." The Applicant understands this to mean that the relationship between force and pressure is non-linear. This is different from non-linearly varying a pressure as recited in claim 10 of the present invention. Any rejection based on a mischaracterization of Fahringer is improper and should be withdrawn.

Rejections under the judicially created obviousness-type double patenting

Within the final Office Action, claims 1-10 and 17-22 are provisionally rejected under the judicially created obviousness-type double patenting as being unpatentable over the claims 1-12 and 24 of the co-pending U.S. Patent Application No. 10/364,284 (the '284 application). (A Notice of Allowance for the '284 application was mailed December 2, 2005.) These rejections are improper because the claims in this application recite structure not recited in the claims of the '284 application.

The independent claim 1 of the present application recites "a seal energizer configured to maintain the upper element against the lower element to maintain the processing volume by maintaining a difference between a sealing force and a force generated within the processing volume within a range selected from a plurality of ranges." This element is neither recited nor made obvious by any claims in the '284 application. Accordingly, the judicially created obviousness-type double patenting rejection of claim 1 and its dependent claims 2-9 and 17-21 is improper and should be withdrawn.

The independent claim 10 of the present application recites "means for non-linearly varying a sealing pressure to maintain within a selected range a difference between a sealing force and a force generated within the processing volume, thereby maintaining the processing volume." This element is neither recited nor made obvious by any claims in the '284 application. Accordingly, the judicially created obviousness-type double patenting rejection of claim 10 is improper and should be withdrawn.

The independent claim 22 recites "means for maintaining the processing volume by determining the variable processing pressure and generating a sealing pressure that varies non-linearly with the processing pressure." Nowhere is it stated where the '284 application discloses

this element. Accordingly, the judicially created obviousness-type double patenting rejection of claim 22 is improper and should be withdrawn.

The new claims 23 and 24 are allowable.

The new independent claim 23 is directed to an apparatus for processing a semiconductor wafer. Claim 23 recites, in part, a seal energizer configured to maintain a processing volume by maintaining a difference between a sealing force and a force generated within the processing volume within a range. The range is independent of pressures generated within the processing volume. And pressures generated within the processing volume vary between a vacuum and a supercritical pressure.

These limitations find support in the application as filed. As explained above, in the section titled **Rejections under 35 U.S.C. § 112, first paragraph**, embodiments of the invention are directed to maintaining a force differential (ΔF) within a selected range of values. Moreover, the text at pages 26-32 of the Specification discusses varying pressures within the processing volume. Thus, because ΔF is maintained within a range for varying processing pressures, it is independent of the processing pressures within the processing volume, as recited in the limitation of claim 23. Support for pressures varying between a vacuum and a supercritical pressure are given in the Specification at, for example, page 10, lines 9-11, and page 28, lines 17-21.

Claim 24 recites a controller that controls the sealing force, generated by a sealing pressure. The controller follows an algorithm to determine the sealing force, and the algorithm accounts for non-linear variations between the sealing force, the force generated within the processing volume, and the difference between the sealing force and the force generated within the processing volume. This limitation finds support in the Specification at, for example, page 26, line 20 (equation 1); page 27, lines 20-23; page 29, lines 23-27; and page 30, line 21, to page 31, line 5.

None of the cited prior art discloses a seal energizer configured to maintain a processing volume by maintaining a difference between a sealing force and a force generated within the processing volume within a range, where *the range is independent of pressures generated within the processing volume and where pressures generated within the processing volume vary between a vacuum and a supercritical pressure.* For at least these reasons, claim 23, and thus its dependent claim 24, are both allowable.

Conclusion

The Applicant believes that claims 1, 2, 4-10 and 17-24 are in condition for allowance, and allowance at an early date would be appreciated. If the Examiner believes that a telephone conference would expedite prosecution of this application, he is encouraged to call the undersigned at (408) 530-9700.

Respectfully submitted,
HAVERSTOCK & OWENS LLP

Dated: 3-27-06

By _____
Thomas B. Haverstock
Reg. No.: 32,571
Attorneys for Applicant

CERTIFICATE OF MAILING (37 CFR§ 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450

HAVERSTOCK & OWENS LLP.
Date: 3/28/06 By: _____